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NPS Department of Mechanical and Aerospace Engineering Research Associate Professor Noel Du Toit has spent the last several days living 60 feet underwater at the Aquarius Reef Base habitat in the Florida Keys. Du Toit is an Aquanaut with the NASA Extreme Environment Mission Operations (NEEMO) 21 mission, and is performing his own research in human-robot interaction while assisting NASA prepare for its journey to Mars.

"This truly has been an amazing experience," Du Toit said from the habitat. "Being a diver, I have dived on my share of reefs, but that does not compare to living underwater. It truly feels like an alien world when you walk on the seafloor to execute science tasks, and that makes this facility and mission an excellent opportunity to test various operational concepts."

Du Toit says his experience living underwater has been truly eye-opening, especially with regard to his own research in human-robotic interaction and diver-assist robotics.

"For all the progress that we have made in the field of AUVs [autonomous underwater vehicles] over the last two or so decades, we have a long way to go. That becomes apparent when you get to observe these systems underwater over longer periods of time, as this mission has allowed me to do," he said.

"This is even more evident when compared to the grace and effortlessness with which natural organisms navigate the oceans," Du Toit continued. "Underwater robotic systems have become substantially more robust … Our efforts in underwater perception and localization remain valid, but there is much work to be done on the physical systems and hardware before our systems will seem appropriate for this environment."

The Aquanaut crew for the latest NASA Extreme Environment Mission Operations (NEEMO) 21 mission is pictured outside the Aquarius Reef Base habitat in the Florida Keys. For several days in late July 2016, NPS Research Associate Professor Noel Du Toit, pictured top left, has lived in the habitat, performing research to advance his work in human-robot interaction and diver-assist robotics.

Du Toit says the long duration of operating his robotics systems underwater has allowed him to truly understand the strengths and weaknesses of their capabilities, and where further study is needed. He says one need to look no further than nature for inspiration.

"The systems that we have currently are sufficient when conditions are good, but in the real world, that is seldom the case. Yet, my underwater home is surrounded by much smaller fish, capable of dealing with these challenges with effortlessness and grace. There is clearly much work to be done."

For more information on Du Toit's research, check out:

- NPS Professor to Join Astronauts in Return to Aquarius Habitat

- NPS Center for Autonomous Vehicle Research

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